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*Stated Meeting, January 20, 1899.*

Vice-President SELLERS in the Chair.

Present, 12 members.

The death of Major Jedediah Hotchkiss, of Staunton, Va., a member of the Society, was announced.

A verbal communication was made by Mr. Wadamori, of Japan, upon "A New System of Mnemonics."

A paper entitled "Photometric Researches," by Prof. Hugo Seeliger, of Munich, Bavaria, translated and edited by Prof. A. W. Myers, of the University of Illinois, was offered for the *Transactions*, and on motion was referred to a Committee consisting of Profs. E. C. Pickering, C. L. Doolittle and M. B. Snyder.

A communication for the *Proceedings* from Mr. A. Radcliffe Grote, on "Specializations of the Lepidopterous Wing; the Parnassi-Papilionidæ. I," was read.

Dr. I. Minis Hays was elected Librarian for the current year.

Pending nominations Nos. 1477, 1478, 1480, and new nominations Nos. 1481, 1482, 1483, 1484, 1485, 1486, 1487, 1488 and 1489, having been read, the meeting was declared adjourned.

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## SPECIALIZATIONS OF THE LEPIDOPTEROUS WING; PARNASSI-PAPILIONIDÆ.

### I.

BY A. RADCLIFFE GROTE, A.M.

(Read January 20, 1899.)

This communication embodies results obtained from a study of the neururation of the types of genera proposed in literature in the Papilionides. It may be considered as a contribution to phylogeny in the group, from the fact that it exhibits the characters of specialization recognized by me in the structure of the wings, while the inference is accepted that the more specialized are also the younger

forms. It may also be looked upon as a contribution to taxonomy, because the differences noted may find their place in generic descriptions and serve to regulate the extension of minor groups of the species.

I have divided (February, 1897) the Butterflies, or diurnal Lepidoptera, into two major groups, which may be thus defined :

- Vein ix of fore wing present ; not more than  
one internal vein on hind wing . . . . *Papilionides*.  
Vein ix of fore wing absent ; at least two in-  
ternal veins on hind wing . . . . . *Hesperiades*.

The characters given above to the *Papilionides* seem, at least in combination, exclusive of all other hitherto discovered Lepidoptera. The opposed characters will not exclude larger groups of the Moths from the *Hesperiades*. With the latter the present study is only incidentally concerned. Following modern classificatory notions, I have given to the names of these two major groups of the Butterflies an accepted termination (*ides*), and I would attach to each the taxonomical value of a superfamily. This course seems to be additionally warranted if we accept my assumption that the two groups are not immediately connected, their phylogeny distinct and that no nearer blood-relationship exists between them. These two major groups of the Butterflies have, I am led to believe, developed themselves independently, so that the obvious characters which would unite them have been secondarily acquired, and constitute a parallelism in development. The absolute character of a primary nature which separates the *Papilionides* from the rest of the diurnals is the presence of vein ix on primaries. The neurational characters, used here to divide the *Papilionides* into family and subfamily groups, are in their nature secondary, gradational and recurrent ; in other words, characters of specialization only.

#### CHARACTERS OF SPECIALIZATION.

The first direction in which specialization shows itself lies in the suppression of the media on both wings. In this generally expressed direction the *Papilionides* show a course parallel with that undertaken by the *Pieridæ*, with the difference that the middle

branch of the media, vein  $iv_2$ , becomes cubital; whereas in the Pieridæ it becomes radial, as in the Hesperiadæ generally, with the exception of Leptidia, an aberrant pierine form in which this branch also becomes cubital on the hind wings. In the Lycænidæ-Hesperiadæ it remains central, while it becomes radial in the Nemeobiidæ, as in the Pieri-Nymphalidæ. The upper branch of the media, vein  $iv_2$ , ascends the radius in the specialized forms of the Papilionides, as in the Pieridæ, and does not remain permanently attached to the cross-vein, from the upper corner of the cell, as in the Nymphalids.

The second direction in which specialization shows itself lies in the suppression of the branches of the radius on the fore wings. The five-branched radius, exhibited in a generalized state in the Papilionidæ, becomes four-branched in the most specialized butterflies of the group I have yet examined, in *Parnassius apollo* and its very close ally, *Doritis mnemosyne*.

For the rest, the specializations of the neururation generally show themselves in absorption, so that I have laid it down as a principle that the amount of the specialization is measured by the extent of the absorption or disintegration.

The so-called "tails" to the hind wings in this group are prolongations of vein  $iv_3$ . They are probably to be regarded as characters of specialization, and they possibly had their origin as secondary sexual ornaments of the male sex, although now most of the females have followed suit. In certain Papilios in which the female is mimetic, the "tail" in this sex may have been abandoned after having been originally acquired.

#### NOMENCLATURE AND HOMOLOGY OF THE VEINS.

The ancestors of the Papilionides must have exhibited vein ix of the primaries, since this is evidently a retained and not an acquired character. I follow Comstock in numbering the loop at the base of vii as viii in the Hesperiadæ and other groups. This vein viii is absent in the Papilionides, where there is no place for it. It may have originated in a splitting of vii at base, and not be a relic of a longitudinal separate vein. In this case the number assigned to ix would be incorrect, but the numbering having been introduced, to change it would make confusion, although the vein

itself would be homologous with vein viii of hind wings and not with vein ix of the same pair.

The cross-vein between cubitus and vii very gradually fades out in the more specialized forms of the Papilionides and finally disappears. It fades from its base, where it joins on to vii, upwardly, becoming a mere remnant in the Teinopalpidæ, extending below the cubitus. Mr. Quail has discovered a similar slight blotch in *Anosia*, and I believe correctly homologizes it with the cross-vein of *Papilio*. I have found it still more extended in *Heliconius*, where it reaches, running a little obliquely downward, to about the place where vi would be had this latter vein not faded completely out. In my preparation and the original photograph of *Heliconius* this fragment of the cross-vein is with difficulty to be seen, and I overlooked it at the time. I also failed to notice that *Heliconius* shows a trace of vein viii.

The presence of relics of a cross-vein below cubitus in the Limnadiidæ and Heliconiidæ, homologous with that in *Papilio*, does not necessarily imply consanguinity between the groups. The hypothesis has suggested itself to me that the lepidopterous wing may have originally shown a series of longitudinal and independent veins, connected by a system of cross-veins, and without the present furcations of the branches of the media and radius. The disappearance of the cross-veins would allow of the contact of the longitudinal veins, and probably assist the shifting movements we now perceive in action (PROC. AM. PHIL. SOC., Jan., 1898). The cubital cross-vein would be a relic of these.

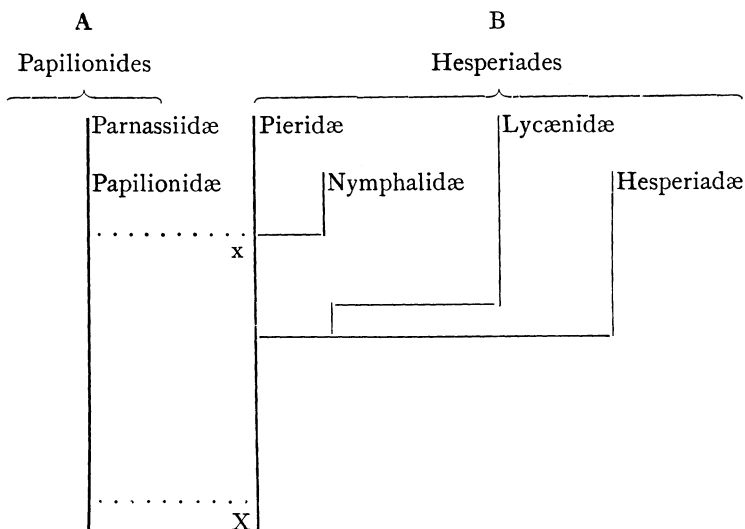
#### GENERAL CLASSIFICATION.

If we assume vein viii of the fore wing in the Hesperiadæ to be a splitting of the vein vii at base, it might not be held to be homologous with the vein viii, occupying the same position, in the Sphingides and other groups of moths. This supposition seems to me untenable. In the lycænid genera *Aurotis*, *Zephyrus* and *Feniseca* I do not perceive any difference in this vein from its appearance in the Hesperiadæ. It becomes simply more prominent and somewhat less strap-like and rigid in the moths. In any case, this vein viii, while allying the Hesperiadæ to the higher groups of moths, is absent in the Papilionides and is replaced by

what I consider to be the undoubted relic of a true longitudinal vein, taking an opposite direction to vein viii, and running outwardly and downwardly to the inner margin of the wing, and which I have called vein ix. If the view is accepted that vein viii originates in a splitting of vein vii at base, then it might be held that this splitting occurred after vein ix had been gotten rid of, and that consequently butterflies with vein viii represent a succeeding stage in this respect. I believe to have shown that, in certain of the more specialized of the Hesperiades, vein viii gradually fades out. In the Nymphalids I find very faint traces of it only in certain Argynninæ. I have found no trace of it in any Satyrid. It has vanished in *Leptidia*, is present in *Pseudopontia*, and, while strong in *Colias*, is fainter in some of the other Pierinæ. Certain Lycænidiæ appear to have lost it, or it is very faint, and this may be the case also with some Hesperians, though in this latter group it is usually quite legible. Conceding its variability, no better evidence perhaps of its power of extinguishment can be offered than that it is strongly marked in *Libythea* and *Limnas*, and that it is incomplete in the related *Heliconius*.

Let our theories as to viii be as they may, one thing seems clear: that no traces of vein ix of the Papilionides have been found in the Hesperiades, and that this latter group is held together, as opposed to the former, by the negative character of its absence.

My attempt therefore, to connect the Papilionides with the rest of the diurnals, has failed. In my first draft of the genealogical tree (1896-1897), and which is still pinned above my desk, I supposed that the point of contact might be with primitive forms, less specialized than the Hesperians. These would have all exhibited vein ix, which the Papilionides had retained, while the other ascending branch had lost it. I reproduce here this sketch, the readier since Dr. Chapman, in letters to me, has queried whether an analogous scheme might not work.



The point x is supposititious and, in my original sketch, marked with a query. I had endeavored also to connect the Papilionides with the Nymphalids. Aside from the major difficulty, the only point of similarity I could then find was the five-branched radius, which in both the Papilionidæ and in the Nymphalids was in a generalized condition. To this must be added traces of the cubital cross-vein in the Limnadiidæ and Heliconiidæ. While too much importance should not be paid to a suppression of branches of the radius now in a fluid state, as in the Pieridæ and Saturniadæ, stress must be laid on the fact that throughout the Nymphalids the five-branched condition is retained, while in the Parnassians we have also a four-branched type, in which the more generalized five-branched condition has been very clearly abandoned. The only movement I have found in the Nymphalid radius consists of a transference of  $iii_2$  to beyond the cell in the Heliconiidæ and certain long-winged forms, or in forms perhaps tending in that direction, such as *Thaleropæ*, *Araschnia*, *Melitæa* and *Euptoieta*; while in the long-winged forms, *Agraulis*, *Dione*, the vein  $iii_1$  has followed suit. A trace of this movement is seen in *Argynnis*, but not in *Issoria lathonia*. I was also impressed by the fact that in the Papilionidæ vein  $iii_1$  did not attain the apex of the primary wing,

but this condition is not constant in the Nymphalidæ, and is abandoned in the Satyrids and *Libythea*. On the other hand, the differences between the Papilionides and Nymphalidæ are numerous. Vein  $iv_2$ , the middle branch of the media, becomes radial in the latter, in the former cubital, in specialization. Vein  $iv_2$  also leaves the lower outer corner of the cell in the Papilionidæ, and, although this position is abandoned in the higher genera of the Parnassiidæ, still it may have been a primitive one, since it occurs now with the more generalized forms. The peculiarities of the papilionid wing are very strong, and notwithstanding the discovery of a remnant of the cubital cross-vein in *Anosia* (Danaus) by Mr. Quail, and by myself in *Heliconius*, I cannot find evidence sufficiently weighty to connect the groups from the neurulation. But while the coincidences allow of some comparison of the Papilionides with the Pieri-Nymphalidæ, although an affinity appears to me to be illusory, it is impossible to consider them as representing in any nearer way an ancestral form of the Lycæni-Hesperiadæ.

Upon the generalized condition of *Hesperia* too much stress has, perhaps, been laid in literature. All the forms of which I have examined the neurulation seem relatively specialized upon their peculiar plan of venation, of which the more modern and advanced outgrowths are to be found in the Lycænidæ, culminating in *Thecla*. But all the butterflies belonging to the Lycænid-Hesperid phylum seem relatively too specialized as to represent adequately the primitive form of the diurnals. Whatever the primitive form was like, the only character in which it may have resembled *Hesperia*, or the primitive form of the Charaxinæ, is that of the separation of the longitudinal veins. The primitive butterfly may have had separated veins, together with cubital cross-veins, of which we find a trace in the Heliconians and Limnads, and an anal vein, like the Papilionides, on the primaries. And, perhaps, by conjuring up a creature rejoicing in apparently residual features, we might attain to a picture in somewhat like manner as Gabriel Max has painted Haeckel's *Pithecanthropus alalus europæus*. But the muse of morphology, as I am now able to understand her, abandons me at this juncture, with the unconnected threads of the groups A and B, the Papilionides and Hesperiadæ, dangling downwards into the abyss of Time, kept apart by the presence of vein ix of primaries in the one and its absence in the other.

The object of my communications upon the wings of butterflies,



of which this series is the last, has, however, been attained in demonstrating that modern classificators (I need not recapitulate their names) have been in error in intercalating the Swallowtails between the Blues and the Skippers. In thus doing violence to the characters of the insects, they have separated two allied groups by the interpolation of a third, not at all nearly related to either. I have further shown that we cannot bring in the Papilionides *after* the Hesperiadæ, since this course would break the sequence of character which allies the Hesperiades with the higher groups of the moths, the Sphingides, Saturniades, Bombycides (Agrotides). I do not assert a belief that the Hesperiades have sprung from common ancestors with these, but I find nothing in the neuriation to render the idea improbable. And I am compelled to add, upon such evidence as is accessible to me, that I cannot say the same of the Papilionides, all connection of which with any of the above-mentioned groups appears to me to present a high degree of improbability. What discoveries await us in the future no one can say, and a naturalist can only come to a conclusion upon the material before him.

The notion that the Papilionides are generalized forms appears to me to be alike overstated. I lay especial stress upon the fact that the hind wings show but one internal vein, whereas all the Hesperiades show two at least. How the outer vein has been gotten rid of is plainly to be traced in the Papilionides, viz., in the same manner as the shortening and weakening of the inner vein has been gradually effected, from where it is stout and long, as in *Ornithoptera*, to where it becomes weaker, more curved and shorter, in *Parnassius*. This shortening of the vein is accompanied by a hollowing away of the tegument along the inner margin. A perfect parallel in this movement is sustained between the Papilionides and Saturniades. More than this: I believe I have found in the rounded and full inner margin of the secondaries in *Ornithoptera* an earlier stage of the hollowed margin of *Papilio*. For this reason, among others, I look upon *Ornithoptera* as being a relatively generalized form in the group. The ancestors of *Papilio* might have had two internal veins on secondaries, and in this they would have resembled the Hesperiades. From this point of view the inference is irresistible that we should commence our lists with the Papilionides. The specialization of the radius on fore wings keeps pace with the shortening of vein viii on hind wings in the Parnassiadæ.

In taking a fresh view of the evolution of the neururation, one is only too liable to overlook minor characters, or again to lay undue stress upon them. But, if I am correct in my major conclusions, if the theory in the main adequately explains the facts, such faults may be eliminated and forgiven. A well-founded division of the butterflies into two larger groups, of equal morphological value, must be considered as a gain to taxonomy, while it eases the study of the waste of butterflies to a hitherto unknown extent. I try to show, not only that the Parnassi-Papilionidæ belong together, but that all the rest of the butterflies are correctly associated in a second group. I have broken the Papilionides away, not only from their supposed affinities with the Whites, but from their incongruous placement with the Skippers also. In the former case I differ from Mr. Reuter, in the latter from Mr. Scudder. It seems to me that light is thus thrown upon a subject on which much has been written which must now appear purposeless, while the new course would enable us to carry with greater certainty the apparatus of classification along the road of phylogeny.

#### MATERIAL.

The authority for the generic names and types which I have here consulted, is Mr. Scudder's *Historical Sketch of the Generic Names Proposed for Butterflies*, Salem, 1875. I regret not to have been able to procure information or material of several generic types published since this date in the Papilionidæ. For specific determinations I am largely indebted to Dr. O. Staudinger and A. Bang-Haas, Blasewitz, Dresden. As far as possible I have studied the neururation of the female sex, since here the question of secondary sexual character is for the most part excluded. Where the male alone has been examined the sex is indicated. Following Mr. Scudder's work, I have omitted to cite the author to the generic type.

#### *Classification of the Papilionides.*

The characters are taken from the position of the veins and their condition. These characters are offered by the neurational movement peculiar to the Papilionides, of which they constitute existing stages, and are hence secondary and characters of specialization only. They are here amplified from my original communication

contained in *Mittheilungen aus dem Roemer-Museum*, Hildesheim, No. 8 (February, 1897).

On primaries vein  $iv_1$  is radial or radially inclined,  
vein  $iv_2$  is cubital.

No traces of cubital cross-vein . . . . PARNASSIIDÆ.

Radius four-branched, specialized *Parnassiinae*.

Radius five-branched, generalized *Zerynthiinae*.

Traces of cubital cross-vein . . . . TEINOPALPIDÆ.

On primaries vein  $iv_1$  from, at or near middle of  
cross-vein; vein  $iv_2$  from the lower outer corner  
of cell equidistant, or nearly so, between  
 $iv_1$  and  $iv_2$ .

A cubital cross-vein reaching  $vi$  or  $vii$  . PAPILIONIDÆ.

Fam. I. PARNASSIIDÆ.

Subfam. 1. *Parnassiinae*.

The radius is four-branched, specialized. There appear to be only two genera in this subfamily, since *Doritis*, with the type *mnemosyne*, does not seem distinct from *Parnassius*, with the type *apollo*. These two genera may be separated as follows:

Vein  $iv_1$  from radius beyond the cell . . . . 1. *Parnassius*.

Vein  $iv_2$  from cross-vein . . . . . 2. *Hypermnestra*.

### *Parnassius apollo*.

In all the species of *Parnassius* I have yet seen, vein  $iv_1$  issues from radius, but since in the succeeding group this vein is fluid in *Zerynthia*, the character may not always hold. In both *apollo* and *mnemosyne* vein  $iii_2$  arises a little before the point at which the cross-vein joins the radius, but, in *Hypermnestra*, at this point. I have been hitherto in error as to the absorption of  $i$  and  $ii$  at base in *Parnassius*. The lower vein is partially degenerate, but distinctly present in both *apollo* and *mnemosyne*. My figures must be corrected in this respect. This Papilionid feature is then retained throughout the group. It is the lower branch, the base of vein  $ii$ , which here seems to fade away. The upper branch, vein  $i$ , is united by a cross-vein, according to Comstock, with vein  $ii$  in *Papilio*. This short cross-vein appears then to become fused with and a continuous part of vein  $ii$ , its real base, while all that remains of it is the "præcostal spur." This may be the true termi-

nation of vein i, the alternative being that the "præcostal spur" is homologous with the shoulder veins of the Lachneidæ. But, in *Papilio machaon*, it is the base of vein i which clearly shrinks, vein ii being strong and continuous. In *Parnassius* the præcostal spur appears to emerge from vein ii, and the cross-vein has become absorbed.

*Hypermnestra helios* (♂).

Characterized by the extreme diminution of the humeral cell of secondaries, which is so reduced as at first to escape notice. The position of vein iii<sub>2</sub> shows an advance upon *Parnassius*, while in that of iv<sub>1</sub> it lags behind its ally. Else the neuration of the two generally agrees.

Subfam. 2. *Zerynthianæ*.

This subfamily must take its name from *Zerynthia* Ochs., 1816, because *Thais* Fabr., 1807, which is the older title for the same type, is preoccupied (Scudder, *l. c.*, 279). Not observing this, I originally used for it the name *Thaidinæ*. No other author, so far as I know, had proposed this division of the Parnassiidæ, which in itself seems a natural one. The Zerynthianæ are intermediate, in the specialization of the wings, between the Parnassiidæ and the Papilionidæ.

Radius five-branched, generalized:

Internal vein (viii) of hind wings relatively short, not reaching anal angle .....	<i>Archon.</i>
Internal vein (viii) of hind wings reaching anal angle:	
Hind wings without special prolongation of vein iv <sub>3</sub> .....	<i>Zerynthia.</i>
Hind wings with slight special prolongation of vein iv <sub>3</sub> .....	<i>Luehdorffia.</i>
Hind wings with a long "tail" to vein iv <sub>3</sub> and also shorter prolongations to veins v <sub>1</sub> and v <sub>2</sub> .....	<i>Armandia.</i>
Hind wings with only a long "tail" to vein iv <sub>3</sub> .....	<i>Sericinus.</i>

*Archon apollinus*.

A character of specialization is found in the shortened and bent internal vein of secondaries which follows the inward

curve of the margin, as in *Parnassius* and the Saturniades. This character is probably more recently acquired. The neuration else shares the main features of that of its group. The humeral cell is narrow and reduced, the lower vein (base of ii) being weaker. On primaries vein  $iv_1$  springs from the cross-vein. Although the pallor of the ground color of the wings suggests the preceding subfamily, the pattern of ornamentation (on the value of which for taxonomical purposes I have been insisting upon for more than thirty years past) is distinctly *Zerynthian*. The discal blotches are intermediate between the bands of *Zerynthia* and the spots of the Parnassians and show the origin of the latter. The subterminal red-marked fasciæ are like *Zerynthia*. *Archon* may be regarded as a generalized form of *Parnassius*, showing the origin of the latter from *Zerynthia*-like ancestry.

*Zerynthia polyxena*.

The material examined shows that vein  $iv_1$  is in a fluid state. In a female this vein leaves the extreme upper corner of the cell. In the male it has passed beyond the cell and issues from the radius. In a female of *rumina*, figured by me (*Mittheilung a. d. Roemer-Museum*, No. 8, Taf. 1, Fig. 2), it leaves the cross-vein. Not only this vein varies in position, but also vein  $iii_s$ , which is further removed outwardly in the specimen in which vein  $iv_1$  leaves the radius. Sufficient material has not been examined to gauge the extent of these variations, but it seems unlikely that they are sexual. As compared with *Archon*, the internal vein of hind wings is less bent and reaches the anal angle, the humeral cell is a little wider, else the neuration generally agrees. Traces of a splitting of vein ii at base appear on fore wings.

*Luehdorfia puziloi*.

The neuration of the female examined agrees exactly with that of *Zerynthia rumina*. Except that the margin of secondaries is more uneven, and that vein  $iv_s$  is produced into a short "tail," no differences whatever have been noted. Vein  $iv_1$  leaves the cross-vein. The forms in which vein  $iv_1$  is still attached to the cross-vein must be regarded as more generalized than those in which it has ascended the radius and is thrown off beyond the cell.

*Armandia thaitina.*

Vein  $iv_1$  leaves the radius at the junction of the cross-vein. Vein  $iii_3$  is well removed beyond the cell. In these characters *Armandia* attains the specialization of *Zerynthia*, but on secondaries the humeral cell is much extended. Vein  $iv_3$  of secondaries is extended, forming a long and slightly spatulated "tail." The extension to vein  $v_1$  is shorter, and that to  $v_2$  is still more abbreviated. The internal vein reaches the anal angle, but it is curved as in the preceding genera, thus more specialized than *Sericinus*, in which it is straight. The long primaries and the tailed secondaries strongly remind one of the Papilionidæ. The pattern of ornamentation and the neurulation are those of its group.

Mr. Scudder (*l. c.*, 121) spells the name of this butterfly "*thaidina*," but Staudinger (in litt.) gives the spelling which I have above adopted.

*Sericinus telamon.*

In this type the sexes differ greatly in color and markings. In the two specimens examined (det. Staudinger) it is, strange to say, the female which shows the more advanced type. But I infer that the differences noted are individual. In both, vein  $iv_1$  leaves the cross-vein, a generalization as compared with *Armandia*, as is also the still larger humeral cell of the secondaries. But in the white male, vein  $iii_3$  leaves the radius *before*, in the yellow, black-striped female just *after*, the point of jointure of the cross-vein. The internal vein on hind wings is straight, and this is a generalization as compared with all preceding generic types. The prolongation to vein  $iv_3$  is very long and quite even in width, not spatulate. In this genus and *Armandia* the cubitus shows a slight scar, the relic of the vanished cross-vein.

So far as I am able to ascertain from accessible literature, I have here discussed the neurulation of all the generic types yet proposed in the Parnassiidæ. It becomes quite clear, I hope, that the neurulation assumes a more specialized type in the Parnassiidæ, as compared with the Papilionidæ, while retaining the essential feature characterizing the entire group. So far as I am aware, no contradiction exists to the view that, commencing our lists with the more specialized members of any group, we should in this case allow the Parnassiidæ to take precedence.

## Fam. II. TEINOPALPIDÆ.

Specialization has carried this family, which consists of but a single type, entirely beyond the range of generic differentiation in the Papilionidæ. The neuration has submitted to changes similar to those characterizing the Parnassiidæ, changes of which I find no more than an indication in the Papilionidæ, so that in some respects it affords an intermediary type. The disintegration of the series of the median veins on primaries has progressed far beyond the present condition of any generic type in the Papilionidæ which I have been able to examine. Vein  $iv_1$  has become radial, vein  $iv$  cubital, and the latter has abandoned its approximately central position and forms an unbroken curve with the cubitus. Thus the whole shape of the cell and cross-vein has undergone an important modification and the proper papilionid type of these parts has been abandoned. The cross-vein is much degenerate across the wider interspace which now intervenes between veins  $iv_1$  and  $iv_2$ . The wing also recalls in its present condition that of *Charaxes*, except that  $iv_2$  is cubital, while the long furcation of  $iii_4$  and  $iii_5$  accentuates the resemblance. The cubital cross-vein has practically vanished. There is a feeble notch on the lower edge of the cubitus and a clouding or thickening of the tegument as far as the submedian fold (vein  $vi$ ). This submedian fold is always stronger at base, and, as we shall see in genera of Papilionidæ, the cubital cross-vein first disappears between it and vein  $vii$ , fading upwardly. The internal vein of hind wing is continued to anal angle and is straight. The "tail" to vein  $iv_3$  is narrow and even (♀). Studying this type, it becomes clearer how the wing of the Papilionidæ may have given rise to the wing of the Parnassiidæ. It may be regarded as a lateral offshoot from the Papilionidæ.

With regard to the propriety of making *Teinopalpus* Hope a family type, there can be no question from the neuration, and when we add to this the peculiar structure of the mouth parts and body it should remove doubt. For, as I tried to show in 1883 (*Papilio*, 3, 36), it appears certain that our categories are quantitative. The quantity assigned to the Papilionidæ is here in all respects exceeded. Alone the shape of the wing, a "superficial" character, remains papilionid, but this is approached by some Parnassians and shared by other Lepidoptera. With regard to the name, it has been proposed by Felder to change it on account of

its hybrid character. It seems to me safer to keep the original term proposed by Hope, the discoverer of the insect, since this course avoids all philological discussion, with which zoölogists are not primarily concerned and perhaps not always competent to enter upon. It seems likely also that in the future *all* rules limiting the action of the law of priority upon the published name will of themselves fall from lack of authority, and that preoccupation will remain the only bar to the use of the original title.

*Teinopalpus imperialis.*

Radius five-branched, generalized;  $iii_3$  at or just beyond the point of juncture of cross-vein;  $iii_4$  and  $iii_5$  a long furcation. Vein  $iv_1$  radial, nearing radius; cross-vein between  $iv_1$  and  $iv_2$  inwardly curved, degenerate. Vein  $iv_2$  distinctly cubital, continuous. Submedian fold (vein vi) indicated, strongly so at base; between the fold and cubitus obliquely placed and faint traces of the vanished cubital cross-vein. On secondaries humeral cell narrow, elongate; the marginal veins subequally strong, the upper slightly thicker, a Parnassian character. Cell entire on secondaries, vein  $iv_2$  cubital. Internal vein straight, continued to anal angle.

Contrary to what has seemed to me elsewhere the almost general rule, the primaries appear here, as also in the Parnassiidæ, more specialized than the secondaries. The falcate fore wings, the sharp outlines, while imparting to this butterfly an artificial look, remind one of the Charaxinæ. The movement of the media in disintegration is Parnassian, while the presence of vein ix on primaries decides at once its position as a member of the Papilionides.

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*Stated Meeting, February 3, 1899.*

Vice-President SELLERS in the Chair.

Present, 19 members.

A letter was read from the President announcing the appointment of the Standing Committees for 1899, as follows:

*Finance.*—Messrs. Philip C. Garrett, William V. McKean and Joel Cook.

*Publication.*—Messrs. Daniel G. Brinton, Henry C. Baird, Patterson DuBois, I. Minis Hays and Joseph Willcox.